Welcome to the NASSP Honours Course GA1
Please read everything written below to ensure that you can participate in the course as smoothly as possible.

Course Title:	**General Astrophyics 1: Stellar Structure & Evolution**
Course Lecturer:	Dr Chris Engelbrecht
Course credits:	1
Lecturer contact hours:	**~**24 x 50-minute lectures

1) Course overview:

This course covers the essential physics related to stellar structure and evolution, as well as selected applications thereof. We will study the physical structure and interior dynamics of stars and derive the basic equations necessary to model their interiors, together with the relevant microphysics, e.g., the equation of state, the physical description of opacity, nuclear reactions, and energy transport. We will examine how stars of different masses evolve and look in some detail at the stellar remnants (e.g., white dwarfs and neutron stars) that remain at the endpoints of their evolution. You will also be introduced to key aspects of asteroseismology, the primary tool for studying stellar structure and evolution at present.

2) Course delivery:

The 24 fifty-minute lectures will be delivered at the times scheduled in the NASSP Honours timetable (**See the timetable under "Resources"** on the AST4007W Vula site), **in the form of live lectures on Zoom run via a video link in the AST Seminar Room**. **Please consult the NASSP calendar for the lecture times.**

Aside from the formal teaching slots where I will be presenting the primary course material, there will also be a number of tutorial sessions (still to be finalised) where a tutor will lead you through additional learning exercises conducted in a group context in the classroom.

For my lectures on Zoom, I use a document camera with a wide field of view so that it can be used as a substitute for a blackboard. This simulates an actual classroom teaching environment as closely as possible, and I have been using this method very successfully in numerous courses over the past five years.

Please note that this means that you have to attend the live lectures to receive the full course content, as you will be following me on the 'whiteboard', taking your own notes as the lecture proceeds. See my comments in section 4 below in this regard.

3) Course breakdown/syllabus:

* Brief overview of stellar parameters and how we infer them
* Setting up the mathematical formalism for describing stellar structure
* Stellar interiors:
    - interaction of EM radiation with matter in stellar interiors
    - some microphysics: stellar opacity
    - energy transfer inside stars
    - the differential equations describing stellar structure
    - the Lane-Emden equation and some simple solutions
* The physics of star formation
* Stellar evolution:
    - some microphysics: nuclear energy generation in stars
    - low-stellar-mass evolution

- high-stellar-mass evolution

* End states of stars
* The physics of stellar pulsation
* Asteroseismology

4) Resources:

Summary slides will be posted on Vula after each day's lecture(s). However, these slides will contain summaries and will not include all the detail discussed in the live online classes. *That is why it is essential to participate in the live classes at the scheduled times.*

There is no set textbook for the course. However, the following standard texts contain material that will align (closely, at times) with the lecture content:

• An Introduction to Modern Astrophysics (any edition), by B.W. Carroll & D. A. Ostlie
• Theoretical Astrophysics, Volume II: Stars and Stellar Systems, by T. Padmanabhan

Any other advanced-level text on stellar physics (e.g., Hansen, Kawaler & Trimble; Prialnik; Kippenhahn, Weigert & Weiss; etc.) will be useful to consult for further background.

Please note, though, that it will not be necessary to consult any resource besides the class notes (which you take during the live lectures) and summary slides to obtain all the formal course material.

5) Assessment

The relative weights of homework, tests/exam, and tutorials are still to be finalised and will be communicated at a later stage. The delivery mode of the mid-term test and exam will also be communicated at a later stage.

I look forward to a stimulating learning experience with you!

My contact details: engelbrecht.chris@gmail.com
[note: UCT has created a uct email address for me as well, but I have no access to it. Please use only the gmail address indicated above]